

AYURVEDIC ALTERNATIVE FOR TREATMENT OF DENTURE STOMATITIS: REVIEW ARTICLE

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ABSTRACT

Candida associated denture stomatitis is a very common inflammatory process affecting about 60% of the prosthodontic patients. Candida Albicans is an innocuous commensal of the microbial community of the human oral cavity. The primary location is the posterior part of the tongue and the other oral sites such as the mucosa, while the film that covers the denture surfaces is colonized secondarily. Frequently when the host defense system suffers because of the alterations like immunodeficiency C. Albicans becomes virulent which results in oral Candidiasis or denture stomatitis. Common drugs used are Imidazole compounds, polyene derivatives (nystatin), and amphotericin B. Many plant extracts also have antifungal activity against Candida albicans such as Triphala Morinda citrifolia, thandhadhavana churnam etc. This paper reviews the ayurvedic anti- candidal agents for Denture Stomatitis.

KEYWORDS: Candida Albicans, Candidiasis, Anti Candidal Agents & Ayurvedic Anti- Candidal Agents

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INTRODUCTION

According to the population census in 2011 there are 104 million elderly individuals aged around 60 years or above in India, 53 million are females and 51 million are males. The size and share of the elderly population seem to be increasing over time. From 5.6% in 1961 the proportion has increased to 8.6% in 2011. Today India is the home to one out of every ten senior citizens of the world where 75% reside in rural areas. A financial crisis is a major problem for an elderly individual in India with nearly half of them is fully dependent on their family members or other forms of caretakers for their survival. As the size of the dependent elderly population is fast growing, there is an emerging need to pay greater attention to age-related oral health issues. According to the National Oral Health Survey, the prevalence of subjects wearing a prosthesis in upper and lower dental arches in the age group of 65-74 years was 10.2% and 11.1%, respectively and the most prevalent prosthesis was complete dentures (1).

Candida associated denture stomatitis is a common inflammatory process affecting around 60 - 65% of denture wearers and is usually found on the palatal mucosa beneath the fitting surface of the upper denture. It has multifactorial etiology, but improper denture hygiene is one of the most prominent contributing factors. Several factors which cause initiation of denture stomatitis are: local trauma from ill-fitting denture, poor denture hygiene, continuous denture wear, bacterial and fungal infection, malnutrition, hormonal imbalance and overuse of antibiotics. Formation of a dental plaque by the normal flora is facilitated by the presence of food debris, irregularities on the acrylic resin, negative pressure in the acrylic resin mucosa interface and therefore follows the

action of microorganisms to result in varying grades of denture stomatitis. Common drugs used for controlling denture stomatitis are Imidazole compounds, polyene derivatives (nystatin), and amphotericin B. However, toxicity and resistance to these antifungal drugs are a major concern to which variable results have been observed and recurrence rates are high. Despite the availability of many commercial denture cleansing products, less than 60% of the wearers make use of any of them.

Different methods of treatment for denture stomatitis have been suggested. Treatment regimens include relining with tissue conditioners, chemical substances such as chlorhexidine and sodium hypochlorite, efficient denture hygiene, the removal of dentures at night and following proper post denture instruction. The association of these procedures with topical application of antifungal agents on the affected areas and on dentures is relevant as well.

However, toxicity and resistance to these antifungal drugs are problems to which variable results have been observed and the recurrence rate is high. Natural medicinal products have proved to be an alternative to synthetic chemical substances and the interest in medicinal plants as a source of antimicrobial agents has grown dramatically. A wide variety of plant extracts have been reported to have antifungal activity against *Candida albicans*. In addition, to these medicinal plants may play a very important role in the treatment of Denture Stomatitis.

There are many specialized products available in the market for denture cleansing, but the elderly population using dentures has decreased access to a continuous supply of such materials. Hence there is a need to introduce a few natural products to cleanse the dentures, which are easily and economically available. Triphala (*Phyllanthus emblica*, *Terminalia chebula* and *Terminalia belerica* fruits powders in equal proportion), *Morinda citrifolia*, *thandhadhavana churnam*, *Phyla nodiflora*, *Commiphora mukul*, *Aloe vera*, and cashew leaves and many other drugs known for their medicinal properties have been traditionally used in India as therapeutic and antimicrobial aids in various ailments and as potent antifungal products effective against *Candida*(2). This literature collection gives a collective idea about Ayurvedic agents which can be used for the treatment of denture stomatitis.

Classification

The alternative in using plants and their essential oils is a new trend in the treatment of *Candida* associated denture stomatitis

- Plants and Essential Oils
- Ayurvedic Agents

Essential Oils

An essential oil is a concentrated liquid which is hydrophobic containing the volatile aromatic compounds extracted from the plants. An oil is "essential" because it contains the "essence of" the plant's fragrance that is the characteristic fragrance of the extracted plant. Essential oils are generally extracted by distillation process or by steaming process. Other processes like absolute oil extraction, solvent extraction, resin tapping, and cold pressing which are used in perfumes, cosmetics, soaps, as a flavouring agent for food and drink, and as an adding scent to incense and household cleaning products.

Studies revealed that some essential oils have the potential to prevent the transmission of drug-resistant pathogens like *Staphylococcus*, *Streptococcus*, and *Candida*. They are used as an antiseptic and anesthetic. Turpentine oil and

camphor are two typical examples of oils that cause such effects. Thymol is well known for its antiseptic property.

Carvacrol

Natural Occurrence

Carvacrol is found in the essential oil of *Origanum vulgare* (oregano), oil of thyme, oil is obtained from pepperwort and wild bergamot. The carvacrol is found 50% in *Origanum majorana* (marjoram) and 60-80% Dittany of Crete. It is also found in tequila.

Biological Properties and Use

Carvacrol inhibits the growth of several bacteria, e.g. *Escherichia coli* and *Bacillus cereus*. In *Pseudomonas aeruginosa* it causes cell membrane damage to these bacteria and unlike other terpenes, which inhibits their proliferation. The cause of the antimicrobial properties is believed to be disruption of the bacterial membrane. It activates PPAR and suppresses COX-2 inflammation.

Dental Applications

Different species of the *Satureja* spp. are used in traditional medicine, food and pharmaceutical industries. Some investigations suggest that the essential oil of the *S. hortensis* has antinociceptive, anti-inflammatory, antifungal and antimicrobial activities and a recent study has also demonstrated that growth of periodontal bacterial inhibition effect. Many pharmacological activities of the essential oil of *Satureja* such as antimicrobial, antifungal, antitumor, analgesic, antispasmodic, anti-inflammatory effects are attributed to the chemical structure of these phenolic compounds. Its role in denture stomatitis has been proved.

Eugenol

Natural Occurrence

Eugenol has a phenylpropene containing an allyl chain-substituted by guaiacol. Eugenol belongs to the phenylpropanoids family. It is a pale yellow oily liquid extracted from clove oil, nutmeg, cinnamon, basil, and bay leaf. It is present in 80–90% concentration in clove bud oil and 82–88% in clove leaf oil (3).

Biological Properties and Use

Eugenol (4-allyl-2-methoxyphenol) is a naturally occurring phenol obtained from cloves. It has antioxidant, a monoamine oxidase (MAO) inhibitor and neuroprotective property. In addition, eugenol exhibits an excellent bactericidal activity against a wide range of organisms like *Escherichia coli*, *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Listeria monocytogenes*.

Dental Applications

- Eugenol is widely used in dentistry for pulpal pain
- Studies show anti candidal activity against *Candida albicans*

Linalool

Natural Occurrence

Linalool is a naturally found in terpene alcohol chemical, which is found in many flowers and spice plants.

The majority of which are based on its pleasant scent belongs to the families Lamiaceae (mint and other herbs), Lauraceae (laurels, cinnamon, rosewood), and Rutaceae (citrus fruits).

Biological Properties and Use

Linalool (3,7-dimethyl-1,6-octadien-3-ol) is a terpene alcohol containing a floral aroma that is commonly found as a primary volatile component of the essential oils of aromatic plants such as lavender (*Lavandula angustifolia*) and bergamot (*Citrus bergamia*).

Dental Applications

- In vitro studies of linalool at concentrations of 0.044% (v/v, approximately 2.5 mM) reported no cytotoxicity against human skin cells [3].
- It possesses anti-inflammatory [4], anti-nociceptive and local anesthetic activities. Linalool also inhibits *C. albicans* growth, with a minimal inhibitory concentration (MIC) range from 0.09 – 0.29% (v/v, approximately 5 – 16 mM).

Terpinen-4-OL

Natural Occurrence

Terpinen-4-ol, is otherwise called as 4-Terpineol. It is an organic compound belongs to terpene family. Its molecular formula is C₁₀H₁₈O. 4-Terpineol has the anti-inflammatory, antibacterial and antifungal effect. Terpinen-4-ol is the primary active ingredient in tea tree oil. It is also found in the essential oil of nutmeg.

Biological Properties and Use

Studies with petri dishes have found that tea tree oil kills methicillin-resistant *Staphylococcus aureus* (MRSA), in nasal or extra-nasal (topical) colonization.

Dental Applications

- It has proven anticandidal activity
- Oral ingestion is contraindicated.

Herbs

Plants have been used for several generations in traditional herbal medicine, as first choice treatment. Currently, due to the advances of the analytical methods, it was possible to elucidate the structure of thousands of phytochemicals, either primary or secondary metabolites. In the following section, we are going to discuss few plants that have anticandidal effects.

Table 1

Name of the Herbs	Source	Effective Activity	Biological Ingredients and its Activity
Propolis	Tree exudates mixed with floral sap, bee salivary secretions, wax, and pollen.	Antibacterial, antifungal, anti-inflammatory, antioxidant, and immunomodulatory	Polymer hydroxypropyl cellulose, flavonoids, ethanol and propylene glycol (13)
Punica granatum	Edible parts of pomegranate fruit	Anti-atherogenic (11), anti-oxidant, anti-tumor(12) virucidal, antifungal	Hydrolysable tannins causes inhibition of adherence
Streblus asper	Streblus asper Lour (Moraceae) tree	Cardiotonic, antifilarial, anticancer, antimicrobial, anti-allergic and antimalarial	Asperoside, strebluside and mansonii. reduce the ability to induce germ tube formation, inhibit Candida germination and reduce attachment to human epithelial cell
Azadirachta indica	Neem tree	Immunomodulatory, anti-inflammatory, antifungal, antibacterial, antiviral and anti-oxidant	Flavonoids causes a decrease in adhesion capacity of cells to composite resin
Vitis vinifera	Grape Seeds	Anti-oxidant, topical antifungal	Epigallocatechin gallate (EGCG) causes inhibition of C. albicans yeast cell growth. IFN- γ enhances the NADPH oxidase activity increases the candida-killing activity
Boesenbergia pandurata	Ginger	Anti-inflammatory, antifungal	Ethanol compounds causes anti bio film formation
Morinda citrifolia	Indian mulberry plant	Anti-inflammatory, anti-microbial, anticarcinogenic, analgesic, hypotensive	L-asperuloside, acubin, alizarin, and other anthraquinones interferes with cellular yeast to a filamentous form of candida
Anacardium occidentale	Cashew nutshell liquid	Antimicrobial, anti-inflammatory, astringent, diuretic, hypoglycaemic	Anacardic acids causes lethality to gram-positive bacteria
Triphala	Phyllanthus emblica	Antimicrobial, antifungal and anticandidal activity	Gallic acid inhibit Candida germination
Pelargonium graveolens	Shrub	Anti-inflammatory and antifungal	Inhibitory effects of geranium oil on growth of Candida
Satureja khuzistanica	Labiatae family	Antiseptic, anti-inflammatory, antinociceptive and analgesic	Ethanol extract has synergistic effects with amphotericin B and ketoconazole
Zataria multiflora	Lamiaceae family	Anti-fungal	Thymol, carvacrol, zatrinal, oleanolic acid, betulic acid, rosmarinic acid and monoterpenoids, sesquiterpenoids, p-cymene, γ -terpinene inhibit Candida growth
Aloe vera	very short stemmed succulent plant	Antimicrobial, antifungal and anticandidal	Lupeol, salicylic acid, urea nitrogen, cinnamonic acid, phenols, and sulfur, have inhibitory action on candida

Table 1: Contd.,			
Salvia officinalis	Lamiaceae family	Anticandidal	8 cineole, β -thujone, borneol, β -elemene and camphor have inhibitory action on candida
Scutellaria baicalensis	Lamiaceae family	Anticandidal	Baicalein inhibited the growth of <i>C. albicans</i>

DISCUSSIONS

Oral candidiasis is a multifactorial disease with various manifestation caused by yeast-like fungal candida. Candidiasis in the presence of predisposing factor occurs as an opportunistic infection in tissues that are poorly equipped and immunologically compromised. In the current times as there is a growing geriatric population candidiasis is prevalent more so in complete denture patients. The association with denture stomatitis is more common in patients with systemic disease. Current literature shows its associated goals in the catalytic protection of cellular nitrosamine which is associated with dysplastic red and white lesion (speckled leukoplakia) and hyperplastic epithelium. Candida is now being considered as a promoting agent or maybe a carcinogen rather than a simple fungal infection. This implication calls for a greater calling for treatment and management of oral candidiasis which, if left untreated and if conditions prevail may lead to dysplastic change.

In Denture stomatitis, the host defenses include mechanical barriers to fungal penetration such as epithelial surfaces, soluble antimicrobial factors, and innate and adaptive cellular immune mechanisms (5). The mucosal epithelium is the first line of defense against the Candida species. It has been acknowledged that the epithelium has a function as a passive physical barrier to prevent Candida from the invasion of the underlying tissue. However, recent studies have shown that the active role played by epithelial cells in triggering immune responses (6). It should be noted that the stratified epithelia (non-keratinized and keratinized) in the oral cavity, which are often colonized by *Candida albicans*, are less likely to be able to endocytose hyphae because most, if not all, cells covering these epithelial surfaces are dead (7). Detection almost invariably involves recognition of pathogen-associated molecular pattern either secreted by or present on the surface of microbes by a large group of receptors termed pattern recognition receptors (PRRs). These PRRs include the receptors like Toll-like receptors (TLRs), the C-type lectin receptors (CLRs), and the Nod-like receptors. Innate immunity in mucosal infection involves many types of cells like : neutrophils, monocytes/macrophages, Natural Killer (NK) cells, dendritic cells (DC), certain CD4+ and CD8+ T cells, non-MHC restricted T cells such as $\gamma\delta$ -T-cells, mucosal epithelial cells, stromal cells and keratinocytes (8). The early stage of the interaction of candida with an acrylic surface is characterized by adherence and the development of blastospores into distinct microcolonies. By 18 to 24 h, the Candida biofilm community can be seen as a bilayered structure comprising a mixture of yeasts, germ tubes, and young hyphae, this intermediate phase is distinguished by the production of extracellular polymeric substance (EPS). During maturation, the biofilms become a thick EPS layer in which a dense network of yeasts, pseudohyphae, and hyphae are embedded (9, 10).

CONCLUSIONS

Ayurveda is an ancient medical science which was developed in India thousands of years ago. It is getting popularity in recent times due to the adverse effects of the allopathic medicine and people's desire towards natural products. It is an effective alternative to many drugs used in the oral cavity. Since current therapy has limitations need for a viable alternative is on the constant search for aging population. This article gives a comprehensive information about the

available ayurvedic agents which may be used in the future as preventive and treatment of denture stomatitis.

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